

# SERVICE INSTRUCTIONS FOR 3M™ 10,000 OPM 3 x 4 in. (75 x 100 mm) ORBITAL SANDERS



## 3M™ Overhaul Service Kit

The part number 20345 3M™ Overhaul Service Kit, contains all the replacement parts that naturally wear over time and a straightforward manual to make servicing an 3M™ sander simple. Overhauling the Orbital Sander can be made even easier with the use of the above Service Tools. The Service Tools also reduce the chance of improper assembly.

Part Number	Description	Qty
3MA0040	EXTERNAL RETAINING RING	1
3MA0021	BEARING - 2 SHIELDS	1
3MB0005	ROTOR	1
3MA0010	VANE	5
3MA0041	WOODRUFF KEY	1
3MA0042	O-RING	1
3MA0019	BEARING - 2 SHIELDS	1
3MA0162	BEARING - NO SEAL/SHIELDS	1
3MA0196	SPACER	1
3MA0161	BEARING - 1 SEAL	1
3MA0039	INTERNAL RETAINING RING	1
3MA0032	MUFFLER INSERT (for 10,000 RPM Machines)	2
3MA0009	VALVE SEAT	1
3MA0007	VALVE	1
3MA0014	VALVE SPRING	1
3MA0043	O-RING	1
3MC0018	MINI PAD SUPPORT	2
3MA0008	VALVE STEM ASSEMBLY	1
3MA0166	MUFFLER HOUSING	1
3MA1413	INSTRUCTIONS FOR 3 in. X 4 in. OS OVERHAUL SERVICE KIT	1

# 3 in. x 4 in. (75 x 100 mm) Orbital Sanders Service Instructions

**NOTICE:** To receive any expressed or implied warranty, the tool must be repaired by an authorized Service Center. The 3 in. x 4 in. (75 x 100) Orbital Sander Service Instructions section provided is for use after completion of the warranty period.

## DISASSEMBLY INSTRUCTIONS

### Changing Grips:

1. The Grip has two "tabs" that wrap around the body of the sander under the inlet and exhaust. With a small screwdriver pick out one of the "tabs" of the Grip, and then continue to go underneath the grip with the screwdriver and pry the Grip off the sander. To install a new Grip, hold the Grip by the tabs making them face outward, align the Grip and slide it under the Throttle Lever then press the Grip down until it seats onto the top of the sander. Make sure the two "tabs" seat under the inlet and exhaust.

### Motor Disassembly:

1. Remove the Pad from the machine by removing the four Screws. Lightly secure tool in a vise using the T-7 Soft Collar or padded jaws with the bottom of the machine facing upward. Remove the four Screws and then the Screw. Remove the Pad Backing but be careful to observe and collect the optional Spacer(s) found between the Spindle Assembly and the Pad Backing.
2. Take the machine out of the vise and take off the Soft Collar. Remove the four Screws with the Washers from the Housing and remove the Mini Pad Supports. Lightly re-secure the tool in a vise using the T-7 Soft Collar or padded jaws with the Lock Ring facing upward.
3. Remove the Lock Ring with the T-6 Motor Lock Ring Wrench/Spindle Puller Tool. Remove the O-Ring from the Lock Ring and set it aside. The motor assembly can now be lifted out of the Housing.
4. Remove the Retaining Ring from the groove in the Shaft Balancer and the O-Ring from the Cylinder.
5. Remove the Rear Endplate. This may require setting the Rear Endplate on a Bearing Separator and lightly pressing the shaft through the Bearing and Rear Endplate. Remove the Cylinder and the Rotor with the five Vanes from the Shaft Balancer. Remove the Key then press off the Front Endplate with the Bearing. It may be necessary to remove the Bearing with a Bearing Separator if it came out of the Front Endplate and stuck to the shaft of the Shaft Balancer.
6. Remove the Bearing(s) from the Endplates by using the T-8 Bearing Removal Tool to press out the Bearings.

### Shaft Balancer and Spindle Disassembly:

1. Grip the shaft end of the Shaft Balancer in a padded vise. With a thin screwdriver pick out the slotted end of the Retaining Ring and peel out.
2. Screw the female end of the T-12 5/16-24 to M6 x 1P Adapter into the male end of the T-6 Motor Lock Ring Wrench/Spindle Puller Tool. Screw the Service Wrench Assembly into the Spindle Assembly until hand tight. Apply a gentle heat from a propane torch or hot air gun to the large end of the Shaft Balancer shaft until it is about 212° F (100° C) to soften the adhesive. Do not over heat. Remove the Spindle Assembly by using the slider to give sharp outward blows to the Spindle. Allow the Spindle and Shaft Balancer to cool.
3. Remove the Retaining Ring from the Spindle Assembly. Use a Bearing Separator to remove the Bearing, Shim, Bearing, Shim and the Washer from the Spindle Assembly.

4. The bearing shield components are held in place by the light press fit of the Retainer. These components can be damaged during removal and may need to be replaced if removed. To remove the Retainer, use an O-ring pick or a #8 sheet metal screw to grip and pull out the Retainer. Remove the Valve and Filter from the bore in the Shaft Balancer. If the Retainer and Valve were not damaged, they can be reused. However, the filter should be replaced on re-assembly.

### Housing Disassembly:

1. For Non-Vacuum (NV) and Central Vacuum (CV) machines follow steps A – C below (unless otherwise noted). For Self Generated Vacuum (SGV) machines disregard steps A – F and move onto Step G below.
  - A. Unscrew the Muffler Housing from the Housing.
  - B. Remove the Muffler from the cavity of the Muffler Housing.
  - C. Remove the Plate and second Muffler from the exhaust port of the Housing.
- For Central Vacuum (CV) Exhaust machines:**
  - D. Remove the Screw, Washer and Nut.
  - E. Press downward on the swivel end of the Ø 1 in. (28 mm) CV Swivel Exhaust Assembly or the Ø ¾ in. (19 mm) CV Swivel Exhaust Assembly releasing the tab on the end of the exhaust assembly from the Snap-In Exhaust Adapter.
  - F. Work off the Snap-In Exhaust Adapter. Move on to step 2.

### For Self Generated Vacuum (SGV) Exhaust machines:

- G. Unscrew the SGV Retainer Assembly with an 8 mm hex key. Remove the two O-rings. Take off the Ø 1 in. (28 mm) SGV Swivel Exhaust Assembly or the Ø ¾ in. (19 mm) Hose SGV Swivel Exhaust Assembly.
- H. Work off the Snap-In Exhaust Adapter.
2. Place the Speed Control to the midway position and remove the Retaining Ring. The Speed Control will now pull straight out. Remove the O-Ring.
3. Unscrew the Inlet Bushing Assembly from the Housing. Remove the Valve Spring, Valve, Valve Seat, Valve Stem with the O-Ring. Press out the Spring Pin from the Housing and remove the Lever.

## ASSEMBLY INSTRUCTIONS

**NOTE:** All assembly must be done with clean dry parts and all bearings are to be pressed in place by the correct tools and procedures as outlined by the bearing manufacturers.

### Housing Assembly:

1. Install the Throttle Lever into Housing with the Pin.
2. Lightly grease O-Ring and place it on Speed Control. Install Valve Stem, O-Ring (cleaned and lightly greased) and insert the Speed Control into Housing in the midway position. Install Retaining Ring.

**CAUTION:** Make sure the Retaining Ring is completely snapped into groove in the Housing.
3. Install the Valve Seat, the Valve and Valve Spring. Coat the threads of the Bushing Assembly with 1 or 2 drops of 3M Rite-Loc TL22 or equivalent non-permanent pipe thread sealant. Screw the assembly into the Housing. Torque to 60 in/lbs (6.77 Nm.) Place a clean Muffler and Plate into the exhaust port of the Housing. Be careful not

to lose the Plate and Muffler out of the exhaust before it is secured in one of the following steps.

NOTE: If the machine is a CV/SGV model proceed with the appropriate vacuum exhaust assembly instructions, otherwise move onto step 4.

#### For CV (Central Vacuum) Exhaust machines:

- A. Attach the Snap-In Exhaust Adapter.
- B. Take the  $\varnothing$  1 in. (28 mm) CV Swivel Exhaust Assembly or the  $\varnothing$   $\frac{3}{4}$  in. (19 mm) CV Swivel Exhaust Assembly and put the "tongue" on the male end of it into the female end of the Snap-In Exhaust Adapter. With the swivel end of the Exhaust angled towards the ground work the "tongue" and male end into the female end of the Snap-In Exhaust Adapter by rotating the swivel end up and in at the same time until it seats.
- C. Thread the Screw into the mounting hole of the  $\varnothing$  1 in. (28 mm) CV Swivel Exhaust Assembly or the  $\varnothing$   $\frac{3}{4}$  in. (19 mm) CV Swivel Exhaust Assembly and Housing until the end of it is flush with the inside surface of the Housing. Place the washer and Nut into the cavity of the Housing and thread the Screw into them until tight. Move onto step 4.

#### For SGV (Self Generated Vacuum) Exhaust machines:

- A. Attach the Snap-In Exhaust Adapter.
- B. Lightly grease two O-rings and place them over the two grooves in the SGV Retainer Assembly. Slide the SGV Retainer Assembly into the bore of the  $\varnothing$  1 in. (28 mm) SGV Swivel Exhaust Assembly or the  $\varnothing$   $\frac{3}{4}$  in. (19 mm) Hose SGV Swivel Exhaust Assembly.
- C. Attach the SGV Swivel Exhaust Assembly to the exhaust port of the Housing by means of the SGV Retainer Assembly and by taking the male end of the SGV Swivel Exhaust Assembly and placing it into the female end of the Snap-In Exhaust Adapter. Screw the SGV Retainer Assembly into the threaded exhaust port on the Housing with an 8 mm hex key. Torque to 45 in/lbs (5.08 Nm.). Move onto the section "Spindle, bearing shield and

Balancer Shaft Assembly".

4. Place a clean Muffler in the Muffler Housing and screw the Muffler Housing into the exhaust port of the Housing. Torque to 20 in/lbs (2.25 Nm ).

#### Spindle, bearing shield and Balancer Shaft Assembly:

1. Place the T-2A Spindle Bearing Pressing Tool Base onto a flat, clean surface of a small hand press or equivalent with the spindle pocket facing upward. Place the Spindle into the spindle pocket with the shaft facing upward.
2. Place the Washer on the Spindle shaft with the curve of washer facing out so that the outside diameter of the washer will contact the outer diameter of the Bearing. Lay the Shim on the shoulder of the Spindle. Place the Bearing (one seal) on the Spindle with the seal side toward the Washer. NOTE: Make sure that both the inner and outer races of the Bearings are supported by the Bearing Press Tool when pressing them into place. Press the Bearing onto the shoulder of Spindle using the T-2B Spindle Bearing Pressing Tool Top as shown in Figure 3.
3. Place the Shim over the Spindle shaft and onto the face of the Bearing making sure it is on center. Press the (no seals/shields) Bearing down using the T-2B Spindle Bearing Pressing Tool Top, being careful to make sure the Shim is still centered on the vertical axis of the Spindle shaft and Bearing. See Figure 4. When the Spindle Assembly is done correctly, the Bearings will rotate freely but not loosely and the Shim can be moved but will not slide or move by gravity.
4. Snap the Retaining Ring (not shown in Figure 3 or 4) onto the Spindle Assembly making sure it is completely snapped into the groove.
5. Take the Filter and center it on the small bore that the original Filter was in before removal. With a small diameter screwdriver or flat-ended rod, press the Filter into the bore until it is flat in the bottom of the bore. Place the Valve into the bore so it is oriented correctly, then press the Retainer into the bore until it is flush with the bottom of the Bearing bore.

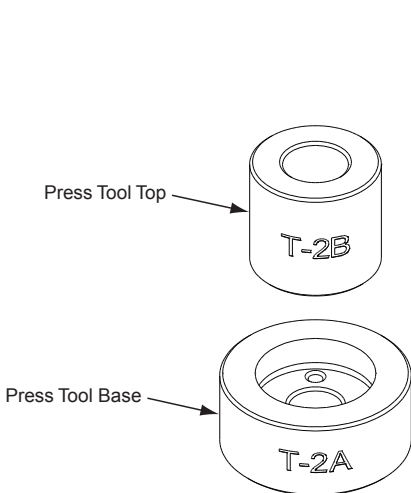


Figure 2

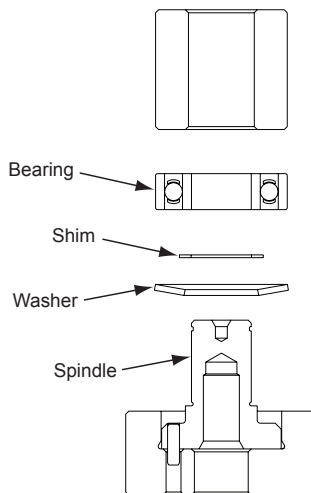


Figure 3

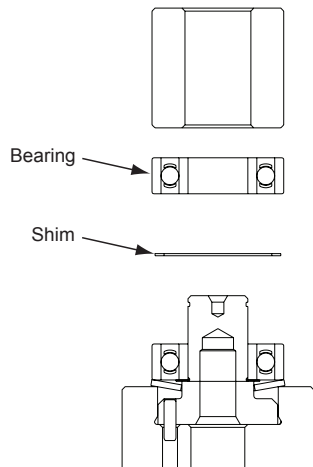


Figure 4

6. Apply a pin head size drop of 3M Rite-Loc TL71 or equivalent to the outside diameter of each of the bearings on the spindle assembly. Spread the drop of bearing locker around the bearings until distributed evenly. CAUTION: Only a very small amount of bearing locker is needed to prevent rotation of the bearing OD. Any excess will make future removal difficult. Place the Spindle Assembly into the bore of the Shaft Balancer and secure with the Retaining Ring. CAUTION: Make sure that the Retaining Ring is completely snapped into the groove in the Balancer shaft. Allow the adhesive to cure.

#### **Motor Assembly:**

1. Use the larger end of the T-13 Bearing Press Sleeve (to Press the front Bearing (with 2 Shields) onto the shaft of the Shaft Balancer.
2. Slide the Front Endplate with the bearing pocket facing down onto the Motor Shaft. Gently press the Front Endplate onto the front Bearing using the larger end of the T-13 Bearing Press Sleeve until the front Bearing is seated in the bearing pocket of the Front Endplate. CAUTION: Only press just enough to seat the Bearing into the pocket. Over-pressing can damage the Bearing.
3. Place the Key into the groove on the Shaft Balancer. Place the Rotor on the Shaft Balancer, making sure that it is a tight slip fit.
4. Oil the Vanes with a quality pneumatic tool oil and place them in the slots in the Rotor. Place the Cylinder Assembly over the Rotor with the short end of the Spring Pin engaging the blind hole in the Front Endplate. NOTE: The Spring Pin must project .060 in. (1.5 mm) above the flanged side of the Cylinder.
5. Press fit the rear Bearing (2 shields) into the Rear Endplate with the T-1B Bearing Press Tool Top. Make sure the T-1B Press Tool is centered on the O.D. of the outer race. Lightly press fit the Rear Endplate and Bearing over the Shaft Balancer using the small end of the T-13 Bearing Press Sleeve. The sleeve should press only the inner race of the bearing. IMPORTANT: The Rear Endplate and Bearing is pressed correctly when the Cylinder is squeezed just enough between the Endplates to stop it from moving freely under its own weight when the shaft is held horizontal, but be able to slide between the Endplates with a very light force. If the assembly is pressed to tightly the motor will not run freely. If the pressed assembly is to loose, the motor will not turn freely after assembly in the Housing. CAUTION: If the Rear Endplate assembly is "over-pressed" damage to the Front and Rear Endplate Bearings may result.
6. Secure the assembly by placing the Retaining Ring in the groove of the Shaft Balancer. CAUTION: The Retaining Ring must be placed so that the middle and two ends of the hoop touch the Bearing first. Both raised center portions must be securely "snapped" into the groove in the

Shaft Balancer by pushing on the curved portions with a small screwdriver.

7. Lightly grease the O-Ring and place in the air inlet of the Cylinder Assembly.
8. Lightly grease or oil the inside diameter of the Housing, line up the Spring Pin with the marking on the Housing and slide the Motor Assembly into the Housing. Make sure the Pin engages the pocket in Housing.
9. Carefully screw the Lock Ring into the Housing with the T-6 Motor Lock Ring Wrench/Spindle Puller Tool. Torque to 60 in/lbs (6.77 Nm.). NOTE: A simple technique to assure first thread engagement is to turn the lock ring counter clockwise with the T-6 Motor Lock Ring Wrench/Spindle Puller while applying light pressure. You will hear and feel a click when the lead thread of the lock ring drops into the lead thread of the housing.
10. Place one of the Mini Pad Support Assemblies into the Housing with the 45 degree chamfer of the base facing outward away from the center of the machine and the arc in the base of the pad support facing toward the center of the machine. Screw tight with the two Screws and Washers. Repeat for second pad support.
11. Using a straight edge placed across both bottom surfaces of the Mini Pad Support Assemblies, measure the distance from the surface of the Spindle Assembly to the straight edge. There should be approximately .010 in. (0.25 mm) of space, if not add supplied Spacers in the combination that most closely results in .010 in. (0.25 mm) of spacing. NOTE: Spindle face must be slightly below Mini Pad Supports for best function. Do not over shim. Apply a small amount of anti-seize compound in the 5-90° c/sink holes of the Pad Backing before assembly. Place the Pad Backing by orientating the Shims with the screw holes and placing the pad backing down onto the Spindle Assembly making sure the Pin goes through the Pad Backing. Add the Screw first and tighten firmly. In a circular rotation apply smaller Screws into the Pad Backing and Mini Pad Support Assemblies but leave them slightly loose until all are in place, and then tighten firmly.
12. Attach a new Pad on the Pad Backing with the four Screws.

#### **Testing:**

Place 3 drops of quality pneumatic air tool oil directly into the motor inlet and connect it to a 90 psig (6.2 Bar) air supply. The tool should run between 9,500 and 10,000 Orbits per Minute when the air pressure is 90 psig (6.2 Bar) at the inlet of the tool while the tool is running at free speed.

# Troubleshooting Guide

Symptom	Possible Cause	Solution
Low Power and/or Low Free Speed	Insufficient Air Pressure	Check air line pressure at the Inlet of the Sander while the tool is running at free speed. It must be 90 psig (6.2 Bar).
	Blocked Muffler(s)	See the "Housing Disassembly" section for Muffler removal. Replace Muffler Insert (See the "Housing Assembly" Section)..
	Plugged Inlet Screen	Clean the Inlet Screen with a clean, suitable cleaning solution. If Screen does not come clean replace it.
	Worn or Broken Vanes	Install a complete set of new Vanes (all vanes must be replaced for proper operation). Coat all vanes with quality pneumatic tool oil. See "Motor Disassembly" and "Motor Assembly".
	Internal air leakage in the Motor Housing indicated by higher than normal air consumption and lower than normal speed.	Check for proper Motor alignment and Lock Ring engagement. Check for damaged O-Ring in Lock Ring groove. Remove Motor Assembly and Re-Install the Motor Assembly. See "Motor Disassembly" and "Motor Assembly".
	Motor Parts Worn	Overhaul Motor. Contact authorized Service Center.
	Worn or broken Spindle Bearings	Replace the worn or broken Bearings. See "Shaft Balancer and Spindle Disassembly" and "Spindle Bearings, Bearing Shield and Shaft Balancer Assembly".
Air leakage through the Speed Control and/or Valve Stem.	Dirty, broken or bent Valve Spring, Valve or Valve Seat.	Disassemble, inspect and replace worn or damaged parts. See Steps 2 and 3 in "Housing Disassembly" and Steps 2 and 3 in "Housing Assembly".
Vibration/Rough Operation	Incorrect Pad	Only use Pad Sizes and Weights designed for the machine.
	Addition of interface pad or other material	Only use abrasive and/or interface designed for the machine. Do not attach anything to the Sanders Pad face that was not specifically designed to be used with the Pad and Sander.
	Improper lubrication or buildup of foreign debris.	Disassemble the Sander and clean in a suitable cleaning solution. Assemble the Sander. (See "Service Manual")
	Worn or broken Rear or Front Motor Bearing(s)	Replace the worn or broken Bearings. See "Motor Disassembly" and "Motor Assembly".
	For central vacuum machines it is possible to have too much vacuum while sanding on a flat surface causing the pad to stick to the sanding surface.	For CV machines reduce vacuum through the vacuum system.